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74. *The Relationship between External and Internal Calcium Concentrations and Prolactin Cell Activity in a Euryhaline Teleost.* S. E. WENDELAAR BONGA, J. A. A. GREVEN, AND C. MEIN, Zoological Laboratory, University of Nijmegen, Nijmegen, The Netherlands.

In teleosts prolactin is the predominant factor in the endocrine control of hydromineral regulation in fresh water. It has been concluded from pituitary transplantation and *in vitro* experiments that prolactin release *in vivo* is inversely related to environmental sodium concentration or osmolarity, an effect thought to be mediated by sodium concentration and osmolarity of the blood. This hypothesis was tested in sticklebacks (*Gasterosteus aculeatus trachurus*). As judged by morphometric parameters at both the light and electron microscope levels, the prolactin cells were inactivated by high external concentrations of divalent cations in fresh water, especially calcium (10 mmole/liter), and activated by calcium- and magnesium-free fresh water, or sea water. The cells reacted only slightly to high sodium concentrations (410 mmole/liter) and high osmolarity. Analysis of blood plasma indicated that prolactin cell activity is not related to changes in plasma sodium or osmolarity. A negative correlation was found between prolactin cell activity and plasma ionic calcium levels. Moreover, after removal of the Stannius bodies, which leads to an increase of plasma calcium and a reduction of plasma sodium levels—osmolarity being unaffected—prolactin cell activity was reduced. Injections of ovine prolactin have a hypercalcemic effect. It is suggested that prolactin facilitates survival in a low-calcium environment, i.e., fresh water, by compensating for the effects of low calcium levels on water and ion permeability of the integument. It is suggested that the effect of environmental calcium concentration on prolactin cell activity is mediated by plasma ionic calcium level.

75. *A Combined Structural and Physiological Analysis of the Effect of Testosterone on Renal and Extrarenal Osmoregulation in Gasterosteus aculeatus.* A. J. H. DE RUITER, Department of Zoology, University of Groningen, Haren (Gr.), The Netherlands.

The three-spined stickleback migrates in spring from salt to fresh water to breed. This has considerable osmoregulatory consequences, which are enhanced in mature males, because 90% of the renal tubule cells are transformed into cells producing the mucus needed for nest building. This transformation, resulting in loss of normal kidney function, takes place under the influence of androgen. Transformation (in which all typical properties of ion-transporting cells disappear) was shown to take place within 28 days after exposing immature males to long days (16L–8D, 20°C). Similar changes were found in castrates within 3–4 days after administration of methyl-testosterone. This influence of androgen is a direct one, since organ culture experiments showed that 11-keto-testosterone induced comparable changes *in vitro* after 5 days of incubation. To obtain information about renal and extrarenal osmoregulation in maturing males in fresh water, light and electron microscopical studies were carried out on kidneys and intestine, while urine and intestinal fluid production was physiologically estimated. In the glomeruli the mesangial layer and basement membrane (together probably forming a filtration barrier) greatly increase in thickness, while the lumina of the glomerular capillaries decrease. Moreover, changes were observed in the podocytes of the glomerulus, which are comparable to changes seen in some cases of glomerular lesions in man and rats. All these phenomena suggest a decrease of the glomerular filtration rate. A microsurgical technique was developed by which the anal opening could be laterally displaced. This made it possible to collect intestinal fluid separately from the urine without having to canulate the urethra. It was found that mature male sticklebacks produce about five times more intestinal fluid than immature males, while their urine production decreases. These data indicate that the intestine may form a very important pathway to drain off the excess of osmotically accumulated water in mature males living in fresh water. (Supported by the Netherlands Organization for the Advancement of Pure Research (Z.W.O.).)

76. *Concentration of Plasma Cortisol and Plasma Electrolytes in Salt Water-Adapted Tilapia mossambica.* H. ASSEM AND W. HANKE, Department of Zoology II, University of Karlsruhe, Karlsruhe, Federal Republic of Germany.

The present paper deals with changes in total plasma cortisol levels as measured by using a competitive protein-binding technique. In addition, the concentration of electrolytes and the osmolality of the blood were determined. We have done three different experiments: (1) Fish were transferred directly to SW and killed in groups of seven fish at various times for up to 6 days. Plasma osmolality, sodium, and chloride reached their peak at Day 1 and returned to normal level during the next few days. Plasma cortisol level increased insignificantly 6 hr